Ficus citrifolia P. Miller Jagüey blanco

Moraceae Mulberry family

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Ficus citrifolia P. Miller trees, also known as jagüey blanco (Spanish), shortleaf fig (English), boislaglu (French), and a host of other common names, have attractive foliage but crooked and branchy form (fig. 1), often with many aerial roots wrapped around their trunks. Seedlings become established in the crowns of other trees, on rock outcrops, cliffs, and old masonry buildings, but rarely, if ever, on the shady forest floor. Jagüey blanco trees are planted for living fenceposts and occasionally as ornamentals; the wood is used to a limited extent for fuel, carpentry, and musical instruments.

HABITAT

Native Range

The extent of the native range of jagüey blanco is problematic due to a poor definition of the species (fig. 2). The genotype typifying jagüey blanco grows from southern Florida and the Bahamas through the Greater and Lesser Antilles (*13, 15, 16*). Populations of *Ficus* spp. from southern Mexico through Central and South America to Paraguay have been identified at different times as jagüey blanco (*17, 20, 24, 25*). The identification of populations from continental areas as *F. citrifolia* should be taken with caution. Indeed, an Amazonian complex formerly attributed to jagüey blanco has been separated into seven species and two provisional species (*2*). However, a later treatise on *Ficus* in Brazil recognizes jagüey blanco as a distinct species (*20*). Definitive research must be completed to ensure certainty of the taxonomy and thus the range of jagüey blanco in continental areas.

Climate

Jagüey blanco grows in subtropical dry forests with rainfall from about 750 to 1000 mm/yr. The species is most abundant in the subtropical moist forest that receives annual rainfall of 1000 to 2000 mm/yr. Trees occasionally grow in the subtropical wet forest in areas with rainfalls from 2000 to about 2500 mm (author, personal observation). A dry season of 2 to 5 months is normally a part of the annual climatic cycle throughout the native range. Mean annual temperatures within the Caribbean portion of the range are from 23 to 25 °C, and mean annual temperatures of 20 to 27.5 °C account for the greater range of the species (*11, 23*). Frosts do not occur within the native range of jagüey blanco.

Soils and Topography

Jagüey blanco grows on soils ranging from sands to clays with pH's from about 5.0 to about 8.5. Although the species grows in soils derived from many types of parent material, those derived from limestone appear to be the most favorable. Mild salt spray is tolerated. Topography is not important, except that in rough topography, rock outcrops and cliffs provide habitat where competition from other species is low. Jagüey blanco is more abundant in the moist limestone hills than in other forested areas of Puerto Rico.

Associated Forest Cover

A stand in a moist forest in Puerto Rico with shallow clay over porous limestone was dominated by *Andira inermis* (W. Wright) H.B.K., *Bucida buceras* L., *Citharexylum fruticosum* L., *Ficus citrifolia*, *Licaria parvifolia* (Lam.) Kostermans, *Ocotea coriacea* (Sw.) Britton, *Sabinea florida* (Vahl) DC., *Spondias mombin* L., *Thouinia striata* (Radlk.) Britton, and *Zanthoxylum martinicense* (Lam.) DC. (author, personal observation). A unique moist forest type occupying limestone cliff faces in Puerto Rico consists almost entirely of two species: *Clusia rosea* Jacq. and jagüey blanco

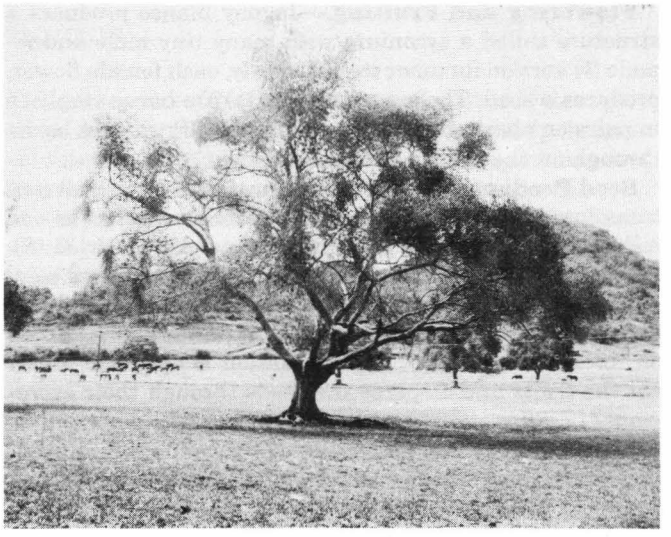

Figure 1.—*Jagüey blanco* (Ficus citrifolia *P. Miller) tree growing in a pasture in Puerto Rico.*

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Figure 2.—*Because of an unsettled taxonomy, the native range (outlined area) of jagüey blanco* (Ficus citrifolia *P. Miller) is more certain in the West Indies than in Central and South America (shaded area).*

(*4*). A moist forest in St. John, U.S. Virgin Islands containing jagüey blanco was dominated by *Bursera simaruba* (L.) Sarg., *Guapira fragrans* (Dum.-Cours.) Little, *Maytenus laevigata* (Vahl.) Greseb. ex Eggers, *Sabinea florida*, and *Spondias mombin* (*27*). In the few uncultivated areas on the island of Anguilla, dominant trees include jagüey blanco, *G. fragrans*, *Pisonia subcordata* Sw., and *Tabebuia pallida* (Lindl.) Miers (*14*).

LIFE HISTORY

Reproduction and Early Growth

Flowering and Fruiting.—Jagüey blanco produces a structure called a syconium with many tiny male and female flowers on its inner walls. Ideally, each female flower, produces a seed. The syconium (fruits) are borne singly or in pairs on short stalks at the leaf nodes. Fruits are borne throughout the year in great numbers (*17*).

Seed Production and Dissemination.—Each fruit contains hundreds of tiny, yellowish white seeds that in one collection averaged 4.6 million seeds per kg air-dried (*8*). Seeds can be cleaned in small quantities by careful wet sieving with a fine sieve (30 mesh). Thirty-six-percent germination was obtained beginning 10 days after placing seeds on moist filter paper (*8*). Germination is epigeous. Birds eat the fruits and disperse the seeds through their excrement (*17, 28*).

Seedling Development.—Seeds germinate and seedlings develop in crotches and hollows in trees and on rock outcrops, cliff faces, and masonry walls. Seedlings rarely develop in the shady understory of forest stands. Known as hemiepiphytes (*24*), they use the host tree for support, obtaining their nutrients from rainfall and leachates from the crown and stem of the host. These seedlings grow slowly while a slender aerial root is extending to the ground. During a "vine" stage starting after the aerial root makes contact with the soil, the aerial root developes into a trunk, and the young jagüey blanco trees begin to grow more rapidly (*17*). The occurrence of seedlings is relatively rare, but is balanced by a relatively high survival after seedlings advance to the vine stage. For unknown reasons, the author was never able to grow seedlings beyond the cotyledon stage in laboratory tests.

Vegetative Reproduction.—Reproduction of jagüey blanco by vegetative means is relatively easy. Living fenceposts of the species are regularly established in Puerto Rico by setting 5- to 10-cm-diameter and 1.5- to 2-m tall cuttings as temporary posts in fence lines. Under moist conditions, many of them take root and grow. Six of 24 small (0.5 cm thick and 30 cm long), untreated branch cuttings placed in moist potting mix in a shade house rooted and grew new leaves in 4 to 6 months (author, personal observation). Stumps of poles and young sawlog-sized trees will coppice when cut, and roots will sprout when severed from the parent tree.

Sapling and Pole Stage to Maturity

Growth and Yield.—Jagüey blanco is a medium-sized tree. A height of more than about 15 m can usually be attributed to the headstart gained by growing from the midcrown of another tree. The largest jagüey blanco documented in Puerto Rico is 1 m in diameter and 14 m in height.[1] Little information is available on the growth rate of jagüey blanco. One tree in the lower montane wet forest (*12*) averaged 0.58 cm/yr in diameter growth over a 24-year period, and 10 trees in a subtropical moist forest averaged 0.12 cm/yr in diameter growth over a 2-year period (*26*). Nine trees in a dense moist forest in St. John, U.S. Virgin Islands, added an average of 0.14 cm of diameter per year over a 5-year period (*27*). Apparently, the species has a moderate growth rate when relatively free of competition, but a slow growth rate with competition.

Although jagüey blanco's growth architecture proceeds according to the Rauh's model that normally results in a straight, single trunk with tiers of branches (*10*), the ideal form is lost in the sapling stage in a spreading and branchy crown. In fact, the very poor form of jagüey prevents the species from being utilized extensively for wood products.

It is sometimes desirable to remove jagüey blanco trees from fencerows or forest stands. In a test of chemical control, 36 jagüey blanco trees in Puerto Rico were treated by applying 5 percent 2,4,5-T[2] in diesel oil to a hack-frill girdle. Checked 6 to 12 months after treatment, 61 percent had been killed, the lowest percentage kill of the 16 species tested (*22*). Although 2,4,5-T[2] is no longer used as a herbicide, the poor results illustrate the difficulty of killing a tree with a trunk armored with many fused aerial roots. Until research demonstrates success with other herbicides, felling remains the only sure way to eliminate individuals of the species.

[1] Champion tree register of Puerto Rico. Unpublished data. On file with: International Institute of Tropical Forestry, U.S. Department of Agriculture, Forest Service, Río Piedras, PR 00928-2500.

Rooting Habit.—One of the most prominent features of jagüey blanco is its great profusion of aerial roots. These roots form on the trunk and lower crown and descend along or wrap around the trunk. They become thick and fused, often completely covering the trunk. Sometimes, the aerial roots hang down in mats from the crown. These "beards" are thought to have been the source of the name for Barbados, "land of beards" (*9*). Although the species does not usually have a significant buttress, lateral roots often grow on the surface of hard and rocky ground for some distance from tree trunks.

Reaction to Competition.—Jagüey blanco is intolerant of shade, requiring a sunny environment in the midcrowns of other trees and on rocks outcrops, cliffs, and masonry walls to germinate and establish itself. The roots of epiphytic jagüey blanco trees thicken and coalesce to form a trunk, and, together with many new aerial roots, may occasionally strangle a host tree. More frequently, jagüey blanco trees gradually replace aging hosts through competition and shading. Stands in nine moist forest sites with jagüey blanco present contained from 12 to 31 m^2/ha with an average of 24 m^2/ha of total basal area (*26, 27*).[3]

Damaging Agents.—Although numerous insect species have been noted feeding or living on the foliage, bark, wood, and fruit of jagüey blanco, none appear to be a threat to the species (*19*). Nests and trails of the wet-wood termite *Nasutitermes costalis* (Holmgren) are a common sight on jagüey blanco trees. Because wet-wood termites normally attack only dead wood, such as twigs, branches, posts, and sometimes structures, they rarely affect growing trees.

In a survey of timber resources in Puerto Rico in 1980, 100 percent of jagüey blanco trees of sawtimber size were found to be defective in some way for timber. Forty-two percent of the volume was estimated to be cull; two thirds of that loss was due to form, and one third, due to rot (*1*).

Jagüey blanco wood is quickly discolored by sapwood fungi during the drying process unless treated with a fungicide solution (*18*). The wood of jagüey blanco is not durable upon contact with the ground. Untreated fenceposts of jagüey blanco were partially decayed after 1 year and were estimated to have a mean service life of 1.4 years (*6*). However, soaked in solutions of 5 and 10 percent pentachlorophenol[4] in diesel oil, they had mean service lives of 3.7 and 12.8 years, respectively (*5*).

[2] This herbicide is no longer manufactured or sold in the United States. It is banned for silvicultural use in the United States by the U.S. Environmental Protection Agency.

[3] Alemañy, Salvador. [n.d.] Personal communication with the author. On file with: International Institute of Tropical Forestry, U.S. Department of Agriculture, Forest Service, Río Piedras, PR 00928-2500.

[4] Pentachlorophenol is no longer produced or used in the United States; preservatives currently used yield somewhat shorter service lives.

SPECIAL USES

Jagüey blanco wood is composed of alternating bands of wood fibers and soft parenchyma. This gives the wood an attractive fine striping or banding of tan and brown (*18*). The heartwood is slightly darker than the sapwood. The wood has a high moisture content (119 percent on a dry weight basis) when cut and seasons slowly with little degrade. Shrinkage is about 1 percent radially and 2.8 percent tangentially. The density of air-dried wood is 0.48 g/cm^3 (*18*). Samples from a fencerow tree had an ovendry density of 0.42 g/cm^3 (author, personal observation).

The wood sands and planes easily, but most other machining operations give fuzzed or crumbled surfaces. Screw and nail holding ability is excellent (*18*). Penetration of preservative (cold soak method) is about average for Puerto Rican hardwoods (*7*). The pH of jagüey blanco wood was measured at 5.6, the highest of 27 tropical hardwood species tested (*21*). Thus, there would seem to be little risk of corrosion of fittings and fasteners used in wood of this species. The wood is used to a limited extent for fuel, carpentry, and musical instruments such as guitars and quatros (*17*).

Jagüey blanco trees are used widely, although not intensively, as living fenceposts. In a survey of Puerto Rican timber resources, the species appears 13th in rank of contribution to total basal area in forests managed for coffee shade, but is an insignificant contributor to total basal area of the secondary forests as a whole (*3*). Presumably, jagüey blanco is regarded as a fencerow tree in coffee shade forests. Living fenceposts of jagüey blanco are easy to establish because large cuttings root fairly well and the sprouts are not heavily browsed by pasture animals. As a living fencepost, jagüey blanco has the disadvantage of not producing good fodder and having a dense, spreading crown. Jagüey blanco is used to some extent as an ornamental and shade tree. The foliage of this species is an attractive shiny, dark green, but the trunks are crooked and branched and often covered with aerial roots. Jagüey blanco produces abundant fruit, which is edible for humans, but almost flavorless. It is nonetheless an important food for birds (*28*).

GENETICS

Ficus is a genus of 750 to 800 species distributed throughout the Tropics (*13*). Jagüey blanco is a variable (polymorphic) species with uncertain taxonomy that is spread across a large range. Much taxonomic work remains to be done on both the species and the genus. Jagüey blanco has been known by the synonyms *F. brevifolia* Nutt., *F. laevigata* M. Vahl, *F. lentiginosa* M. Vahl, *F. lentiginosa* M. Vahl var. *imrayama*, *F. pedunculata* M. Vahl, *F. populifolia* Desf., and *F. populnea* Willd. (*13, 16*).

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